

LS-HOST/TERM

LOGICAL
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Addendum to the LS-HOST/TERM Communications Package Manual - 02/10/84

In addition to the parameters shown in the LS-Host/Term documentation, and the parameters for COMM, ADDS25/CMD accepts the following parameters for defining the function keys on the TRS-80 keyboard:

```
=====
F1=arg      refers to function key <F1>
F2=arg      refers to function key <F2>
F3=arg      refers to function key <F3>
SF1=arg     refers to function key <shift><F1>
SF2=arg     refers to function key <shift><F2>
SF3=arg     refers to function key <shift><F3>
```

where arg represents one of the following:

a decimal number from 1 through 255
a hexadecimal number in the form X'00' through X'FF'
a string of characters in the form "a string of characters"

```
=====
For example: if ADDS25 is entered with the command ADDS25 *CL (SF1="Hello"),  
then whenever the <shift> key is held down, and (while holding the shift key),  
the <F1> key is pressed, Hello will be sent.
```

The defaults for these key definitions are:

Key	Definition
==	=====
F1	X'01'
F2	X'02'
F3	X'09'
SF1	
SF2	
SF3	

Note: F3 defaults to the ASCII "TAB" character

The LSI LS-HOST/TERM communications package consists of the following programs:

TERM6/CMD a terminal program which handles all the video effects available on the TRS80 Model 4, when used in combination with the HOST6V/CMD program.

ADDS25/CMD a terminal program which will emulate the video effects available on the ADDS25 terminal, within the hardware limitations of the Model 4.

HOST61/CMD a general purpose HOST program to allow the computer to be controlled by a remote terminal over the RS232. This version does not handle any of the video control functions such as direct cursor positioning.

HOST6A/CMD a HOST program allowing the computer to be controlled by an ADDS25 type video terminal. Many of the video control functions are supported at the remote terminal.

HOST6V/CMD a HOST program allowing the computer to be controlled by a remote computer running the TERM6/CMD program. All system video functions are duplicated at the remote system.

XMODEM/CMD a file transfer program using the popular error-correcting protocol originated by Ward Christiansen for the CP/M operating system. This program may be used alone or in combination with the host or terminal programs.

HEX/CMD a file conversion utility to convert binary files to ASCII hex characters and back again, for transmission to computers that cannot handle the full character set.

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General terminal program information

All LS-HOST/TERM terminal programs operate in exactly the same manner as the standard COMM/CMD program supplied with LDOS/TRSDOS 6.x, with the following exceptions:

If no device name is specified on the command line when loading either ADDS25/CMD or TERM6/CMD, the device *CL is assumed. If a device name other than *CL is used in the SET command when loading COM/DVR, the device name must be specified when executing the terminal program. When running TERM6/CMD to communicate with another computer running HOST6V/CMD, the SETCOM command to initialize the RS232 parameters should include (WORD=8,PARITY=OFF) as parameters. When running ADDS25/CMD, the SETCOM command may include either (WORD=8,PARITY=OFF), (WORD=7,PARITY=ON,EVEN), or (WORD=7,PARITY=ON,ODD). Which is used will depend on the parameters expected by the host computer.

In addition to the parameters which may be given to the COMM/CMD program, TERM6/CMD and ADDS25/CMD will accept the following parameter:

SYNC=sw, where sw=ON or OFF

SYNC may be abbreviated as S, and the default setting is ON. When SYNC is ON, the terminal programs will automatically use XON/XOFF protocol to prevent the host computer from getting more than a few hundred characters ahead of what has been displayed on the video of the terminal. At speeds above 1200 baud, the host computer may be able to send faster than the terminal program can display the characters. The characters will be received at higher speeds and buffered up to the limit of available memory, even with the SYNC parameter OFF, but the display may lag far behind the host computer and become confusing. For example, if the host computer is listing a long file and the user running the terminal program presses <break> or <control-S> to stop the display, the host computer will stop immediately, but the terminal may continue to display characters from its buffer for several seconds. However, when SYNC is on, it may be more difficult to manually stop the host by typing <control-S> when running at high baud rates because the terminal program may be sending <control-Q> (XON) at frequent intervals.

The TERM6/CMD program will start up with the <8-bit> and <HNDSH> options enabled. These functions are required for operation with the HOST6V/CMD program, but could be disabled for other uses. With the exception of the cursor positioning and some video control codes, this program will function exactly like the COMM/CMD program and could be used as a general purpose communications program. The menu display (invoked by pressing <clear><8>) will look like this:

```
*          *
DUPLX ECHO ECOLF ACCLF REWND PEOF    DCC    CLS    8-B    CMD    HNDSH EXIT
==1== ==2== ==3== ==4== ==5== ==6== ==7== ==8== ==9== ==0== ==:== ==-==-
*KI    *DO    *PR    *CL    *FS    *FR    DTD    ???    ID    RES    ON    OFF
*          *  *
```

The ADDS25/CMD program should be used only when communicating with a computer that is configured for use with an ADDS25 type terminal. For example, a TRS-80 Model 16 running XENIX. The ADDS25/CMD program will start up with the <HNDSH> function enabled. The <8-bit> mode is not required for this program.

Getting started

To use the LS-HOST/TERM communications package, two things must be accomplished:

- 1) A communications channel must be established
- 2) The appropriate communications software must be installed

As an example, let's look at hooking up two Model 4's. As seen above, the first step is setting up the communication channel.

Most types of communications channels will fall into two broad groups, local and remote. The remote category includes all setups where the computers involved are connected over telephone lines via modems. The local category includes all setups where there is a "hard-wired" cable connecting the communicating devices.

An example of the remote category could be represented something like this:

(MODEL 4) <RS232 cable> <MODEM> <telephone line> <MODEM> <RS232 cable> (MODEL 4)

One modem would be set to "originate" and the would be set to "answer". Traditionally, the person placing the phone call places their modem in "originate" mode.

An example of the local category could be represented like this:

(MODEL 4) <RS232 extender> <NULL modem adapter> <RS232 cable> (MODEL 4)

The NULL modem adapter takes the place of both modems and the telephone line as shown above. When selecting components and cabling for a local hookup, choose components with the correct number and combination of male and female connectors. Also, the type of cable used will affect data transmission reliability for channels longer than 50 feet. Do not exceed 200 feet without using some form of "short-haul modem".

Now install the communications software. Use the "SET *CL COM" and "SETCOM" commands, to initialize both machines, and set them for the same baud rates. Communication over telephone lines will be limited to 300 baud, unless 1200 baud modems are used. 9600 baud can usually be used over local channels.

At this point, the appropriate terminal program should be invoked on the terminal system (TERM6 in this example). The appropriate host program is invoked on the host system, in this case, HOST6V. See the detailed sections later in this manual regarding answers to the HOST prompts.

Once the host and terminal software is loaded, finish establishing the communications channel. In the case of a local system, plug in the RS232 cables. For a remote system, dial the proper phone number and establish the modem-to-modem connection. Note that an auto-answer modem may be used on the host system.

TERM6 terminal program

TERM6/CMD responds to the following video control sequences in addition to the normal TRS-80 control codes:

X'07'	BELL character <beep>
X'09'	move cursor to tab stop (stops set every 8 column positions)
ESC ESC	cursor up (ESC must be sent twice. ESC represents a X'1B' code.)
ESC Q	end reverse video (same function as X'11' displayed on TRS80 video.)
ESC X r c	display character at row, column r is row + X'20' c is column +X'20'
ESC Y r c	position cursor to row, column r is row + X'20' c is column + X'20'
ESC V screen	redraw 80 x 24 screen
ESC S 1	scroll protect n lines at top of screen 1 = n + X'20'
ESC C n	set new cursor character n = new cursor character

ADDS25 terminal program

The ADDS25 program responds to the following control codes:

X'01'(ctrl-A)	move cursor to bottom left
	if auto scroll is off, cursor moves to top left
X'06'(ctrl-F)	move cursor right (non-destructive)
X'07'(ctrl-G)	ring bell
X'08'(ctrl-H)	move cursor left (non-destructive)
X'09'(ctrl-I)	move cursor right to tab stop
X'0A'(ctrl-J)	move cursor down one line
X'0C'(ctrl-L)	home cursor and clear screen
X'0D'(ctrl-M)	move cursor to left margin
X'11'(ctrl-Q)	enable RS232 output
X'12'(ctrl-R)	enable printer output
X'13'(ctrl-S)	disable RS232 output
X'14'(ctrl-T)	disable printer
X'15'(ctrl-U)	move cursor left (non-destructive)
X'1A'(ctrl-Z)	move cursor up one line
X'1F'	move cursor to left margin of next line
ESC 1	set tab stop at cursor position
ESC 2	clear tab stop at cursor position
ESC I	move cursor left to tab stop (back tab)
ESC K	erase from cursor to end of line
ESC k	erase from cursor to end of page
ESC *	home cursor and clear screen

The following sequences establish fields on the screen with the listed attributes. The position where the attribute is set is displayed as a blank, and the attribute is used in displaying the contents of the screen from this position to the next attribute setting or the end of the screen. The underline and half intensity attributes may be set, but they do not produce any visible effect on the display, due to hardware limitations.

ESC G Ø	normal video
ESC G 1	invisible video
ESC G 2	blink video
ESC G 3	invisible blink
ESC G 4	reverse video
ESC G 5	invisible reverse
ESC G 6	reverse blink
ESC G 7	invisible reverse blink
ESC G 8	normal video (underline on ADDS25)
ESC G 9	invisible video (invisible underline on ADDS25)
ESC G :	blink video (blink underline on ADDS25)
ESC G ;	invisible video (invisible blink underline on ADDS25)
ESC G <	reverse video (reverse underline on ADDS25)
ESC G =	invisible reverse (invisible reverse underline on ADDS25)
ESC G >	reverse blink (reverse blink underline on ADDS25)
ESC G ?	invisible reverse (invisible reverse blink underline on ADDS25)
ESC)	normal video (half intensity ON on ADDS25)
ESC (normal video (half intensity OFF on ADDS25)
ESC .	cursor visible/invisible toggle
ctrl-K r	set cursor address (row) r = row + X'20'
ctrl-P c	set cursor address (column) c = column + X'20'
ESC Y r c	set cursor address (row and column) r = row + X'20' c = column + X'20'
ESC ?	read cursor address (row and column)

ESC 3	enable transparent print (printer ON, video OFF)
ESC 4	disable transparent print (printer OFF, video ON)
ESC 5	disable keyboard
ESC 6	enable keyboard
ESC H	auto-scroll on/off toggle

The ADDS25/CMD program translates the following keyboard characters before transmission. All other key values (except the <clear> key combinations used to control the program) are transmitted as generated by the standard keyboard driver.

key	value	transmitted as
<up-arrow>	X'0B'	X'1A'
<right-arrow>	X'09'	X'06'
<F1-key>	X'81'	X'01'
<F2-key>	X'82'	X'02'
<clear><left-arrow>	X'88'	X'02',X'34',X'0D'
<clear><right-arrow>	X'89	X'02',X'36',X'0D'
<clear><down-arrow>	X'8A'	X'02',X'32',X'0D'
<clear><up-arrow>	X'8B'	X'02',X'38',X'0D'

HOST61 host program

This program will allow the computer to be controlled by a remote terminal over the RS232. This version does not handle any of the video control functions provided through the operating system @VDCTL SVC. All program requests for keyboard input may be supplied from the RS232, and all characters output through the system video driver are transmitted. Carriage return and linefeed characters may optionally be translated to carriage return, linefeed sequences. NULLS may be added after carriage returns for compatibility with a wide range of terminals or computers at the remote location when running programs that do not require video control functions such as direct cursor positioning.

HOST61 provides a 32 character buffer for received characters and uses XON/XOFF protocol to prevent overrunning this buffer. Characters should not be lost during transmission at speeds up to 9600 baud, as long as the remote unit responds to the software protocol and the host computer is not running a program that disables the hardware interrupts.

The link to the RS232 is maintained only when an active carrier signal is detected. When a carrier signal is not present, the host computer will operate at full speed. An optional login function is provided which can require the entry of a password (up to 10 characters in length) before obtaining access to the system.

LOADING HOST61/CMD:

Before loading HOST61/CMD, the system COM/DVR must be initialized. The recommended command is:

SET *CL COM/DVR

followed by:

SETCOM (WORD=8,PARITY=OFF,DTR,RTS)

The BAUD parameter of SETCOM may also be used to establish the correct baud rate.

If an attempt is made to load HOST61 before COM/DVR, the error message "COM/DVR not installed" will be displayed and HOST61 will not be loaded. The system keyboard (*KI) and video (*DO) drivers may not be LINKed or ROUTEd before loading HOST61. If these devices are ROUTEd or RESET after HOST61 is installed, the host function will no longer be active.

HOST61 is initialized by entering HOST61 and answering the following prompts:

Log in new users (Y/N) ?

Answer "Y" if the host program name (Host61) should be displayed at the remote terminal when a new connection is detected. Answering "N" indicates that no special action should be taken when a new connection is detected, and implies that no password will be used.

Require password for login (Y/N)

This prompt is displayed only if the previous question is answered with "Y". Answer "Y" if a password is desired, "N" if not.

Enter password - up to 10 characters.

This prompt is displayed only if the previous question is answered with "Y". Enter the desired password. All alphanumeric and punctuation characters may be used, and upper and lower case letters are considered different. An exact match will be required to access the system.

**Translate line-feed characters displayed on video to carriage return for remote.
(Required for use with most non-TRS80 systems) (Y/N) ?**

On the TRS-80, displaying a line-feed (X'0A) character performs the same functions as a carriage return (X'0D) character, which is not true for most other equipment. Answer "Y" to this prompt unless the translation is known to be undesirable for the intended remote equipment.

**Send carriage return character as carriage return, linefeed sequence.
(Required for use with most non-TRS80 systems) (Y/N) ?**

On the TRS80, a single carriage return or line-feed character performs both functions, that is, the cursor is moved to the beginning of the next line. On most other equipment, a carriage return character moves the cursor to the beginning of the current line, and a line-feed moves to the current position on the next line. Also, most TRS-80 terminal programs have the ability to ignore line-feeds following carriage returns, so the translation will not interfere with most uses. Answer "Y" to the prompt unless the translation is known to be undesirable for the intended remote equipment.

**How many NULLs should be transmitted after a carriage return?
(0 required for most computers or video terminals.**

Hard-copy terminals may require up to 6.)

Some equipment may require a delay after a carriage return is transmitted to avoid dropping characters at the start of the next line. This is provided by sending a number of NULL (X'00) characters. Answer "0" to this prompt unless the remote equipment requires this delay. Values up to 254 will be accepted, but 6 would be a typical number required for a hard-copy terminal.

**Accept character values greater than X'7F ?
(Use only if remote is using 8-bit transmission).**

The system keyboard driver is capable of generating character values from X'00 to X'FF (0 - 255 decimal). Most terminals generate only the characters which can be held in a 7-bit binary value (X'00 to X'7FH). Answer "N" to this prompt unless the terminal or terminal program used at the remote location can send valid characters above X'7FH, and the RS232 parameters are set for 8-bit words, no parity at both ends.

After all the prompts are answered, HOST61 will be installed in high memory and the computer will be ready for remote access. Some auto-answer modems have switchable

options for handling the "carrier detect" line of the RS232 to allow either a continuous signal when the modem is connected, or to pass the actual signal to the computer RS232 input. Modems with this option must be configured to allow the actual state of the carrier signal to be read by the computer. That is, the "carrier detect" line of the RS232 should be active only when the modem is "on-line" and is detecting the carrier signal from a remote modem.

When a carrier is detected on the RS232 line, HOST61 will become active on any request for input or output. If a password was specified, the remote terminal will be prompted to enter the password, and must enter an exact match before proceeding. The password characters are not echoed to the remote, and will not normally be visible as they are entered. The <backspace> key may be used to correct typing during password entry, and <control><X> (or <shift><backspace> on TRS-80s) will delete the entire line already entered. The host computer will appear to be "locked-up" until the remote has entered the correct password or the RS232 connection is disengaged.

When access to the system is established, the remote system will be able to supply input normally typed at the host keyboard, and will receive any output sent through the host video driver.

HOST6A host program

This program will allow the computer to be controlled by an ADDS25 type video terminal. All program requests for keyboard input may be supplied from the RS232, and all characters output through the system video driver are transmitted. Video control characters are translated into values that will cause equivalent effects on the remote terminal (when possible). Many of the special video functions available through the system @VDCTL SVC are also duplicated on the remote screen.

HOST6A provides a 32 character buffer for received characters and uses XON/XOFF protocol to prevent overrunning the buffer. Characters should not be lost during transmission at speeds up to 9600 baud, as long as the remote unit responds to the software protocol and the host computer is not running a program that disables the hardware interrupts.

The link to the RS232 is maintained only when an active carrier signal is detected. When a carrier signal is not present, the host computer will operate at full speed. An optional login function is provided which can require the entry of a password (up to 10 characters in length) before obtaining access to the system.

LOADING HOST6A/CMD:

Before loading HOST6A/CMD, the system COM/DVR must be initialized. The recommended command is:

SET *CL COM/DVR

followed by:

SETCOM (WORD=8,PARITY=OFF,DTR,RTS)

The BAUD parameter of SETCOM may also be used to establish the correct baud rate.

If an attempt is made to load HOST6A before COM/DVR, the error message "COM/DVR not installed" will be displayed and HOST6A will not be loaded. The system keyboard (*KI) and video (*DO) drivers may not be LINKed or ROUTEd before loading HOST6A. If these devices are ROUTEd or RESET after HOST6A is installed, the host function will no longer be active.

HOST6A/CMD is initialized by typing HOST6A and answering the following prompts:

Log in new users (Y/N) ?

Answer "Y" if the host program name (Host6A) should be displayed at the remote terminal when a new connection is detected. Answering "N" indicates that no special action

should be taken when a new connection is detected, and implies that no password will be used.

Require password for login (Y/N)

This prompt is displayed only if the previous question is answered with "Y". Answer "Y" if a password is desired, "N" if not.

Enter password - up to 10 characters.

This prompt is displayed only if the previous question is answered with "Y". Enter the desired password. All alphanumeric and punctuation characters may be used, and upper and lower case letters are considered different. An exact match will be required to access the system.

Send current screen to remote at login (Y/N) ?

This prompt is displayed only if the "Log in new users" prompt is answered "Y". Answer "Y" to cause the remote screen to be updated to reflect the contents of the host screen when the connection is established. Answering "N" will leave the remote screen as it is after the (optional) login. There may no immediate display to show that the connection is established.

After the prompts are answered, HOST6A will be installed in high memory and the computer will be ready for remote access. Some auto-answer modems have switchable options for handling the "carrier detect" line of the RS232 to allow either a continuous signal when the modem is connected, or to pass the actual signal to the computer RS232 input. Modems with this option must be configured to allow the actual state of the carrier signal to be read by the computer. That is, the "carrier detect" line of the RS232 should be active only when the modem is "on-line" and is detecting the carrier signal from a remote modem.

When a carrier signal is detected on the RS232 line, HOST6A will become active on any request for input or output. If a password was specified, the remote terminal will be prompted to enter the password, and must enter an exact match before proceeding. The password characters are not echoed to the remote, and will not normally be visible as they are entered. The <backspace> key may be used to correct typing during password entry, and <control><X> (or <shift><backspace> on TRS80s) will delete the entire line already entered. The host computer will appear to be "locked-up" until the remote has entered the correct password or the RS232 connection is disengaged.

When access to the host system is established, if the "send screen" function was selected when loading HOST6A, the terminal screen and cursor position will be updated to match the host system. The remote system will be able to supply input normally typed at the host keyboard, and will receive any output sent to the host video.

HOST6V host program

This program will allow the computer to be controlled by another computer running the TERM6/CMD terminal program, via the RS232 interface. All program requests for keyboard input may be supplied from the RS232, and all characters output through the system video driver are transmitted out the RS232. The special video functions available through the system @VDCTL SVC are also transmitted in a way to allow duplication at the remote computer running the TERM6/CMD program. All functions normally available at the host machine should be duplicated at the remote running TERM6/CMD. However, it may not be practical to run programs which frequently redraw the screen from a remote computer, due to the time required to update the remote screen over the serial connection.

HOST6V provides a 32 character buffer for received characters and uses XON/XOFF protocol to prevent overrunning the buffer. Characters should not be lost during transmission at speeds up to 9600 baud, as long as the remote unit responds to the software protocol and the host computer is not running a program that disables the hardware interrupts.

The link to the RS232 is maintained only when an active carrier signal is detected. When a carrier signal is not present, the host computer will operate at full speed. An optional login function is provided which can require the entry of a password (up to 10 characters in length) before obtaining access to the system.

LOADING HOST6V/CMD:

Before loading HOST6V/CMD, the system COM/DVR must be initialized. The recommended command is:

SET *CL COM/DVR

followed by:

SETCOM (WORD=8,PARITY=OFF,DTR,RTS)

The BAUD parameter of SETCOM may also be used to establish the correct baud rate.

If an attempt is made to load HOST6V before COM/DVR, the error message "COM/DVR not installed" will be displayed and HOST6V will not be loaded. The system keyboard (*KI) and video (*DO) drivers may not be LINKed or ROUTEd before loading HOST6V. If these devices are ROUTEd or RESET after HOST6V is installed, the host function will no longer be active.

HOST6V/CMD is initialized by typing HOST6V and answering the following prompts:

Log in new users (Y/N) ?

Answer "Y" if the host program name (Host6V) should be displayed at the remote terminal when a new connection is detected. Answering "N" indicates that no special action should be taken when a new connection is detected, and implies that no password will be used.

Require password for login (Y/N)

This prompt is displayed only if the previous question is answered with "Y". Answer "Y" if a password is desired, "N" if not.

Enter password - up to 10 characters.

This prompt is displayed only if the previous question is answered with "Y". Enter the desired password. All alphanumeric and punctuation characters may be used, and upper and lower case letters are considered different. An exact match will be required to access the system.

Send current screen to remote at login (Y/N) ?

This prompt is displayed only if the "Log in new users" prompt is answered "Y". Answer "Y" to cause the remote screen to be updated to reflect the contents of the host screen when the connection is established. Answering "N" will leave the remote screen as it is after the (optional) login. There may be no immediate display to show that the connection is established.

After the prompts are answered, HOST6V will be installed in high memory and the computer will be ready for remote access. Some auto-answer modems have switchable options for handling the "carrier detect" line of the RS232 to allow either a continuous signal when the modem is connected, or to pass the actual signal to the computer RS232 input. Modems with this option must be configured to allow the actual state of the carrier signal to be read by the computer. That is, the "carrier detect"

line of the RS232 should be active only when the modem is "on-line" and is detecting the carrier signal from a remote modem.

When a carrier is detected on the RS232 line, HOST6V will become active on any request for input or output. If a password was specified, the remote terminal will be prompted to enter the password, and must enter an exact match before proceeding. The password characters are not echoed to the remote, and will not normally be visible as they are entered. The <backspace> key may be used to correct typing during password entry, and <control><X> (or <shift><backspace> on TRS80s) will delete the entire line already entered. The host computer will appear to be "locked-up" until the remote has entered the correct password or the RS232 connection is disengaged.

When access to the host system is established, if the "send screen" function was selected when loading HOST6V, the terminal screen and cursor position will be updated to match the host system. The remote system will be able to supply input normally typed at the host keyboard, and will receive any output sent to the host video.

Technical information - the host programs

The following codes are normally displayed on the TRS80 video for control functions:

X'08'	backspace and delete
X'0D'	clear next line/move cursor to left margin of next line
X'0A'	clear next line/move cursor to left margin of next line
X'0E'	turn cursor ON
X'0F'	turn cursor OFF
X'10'	turn reverse video mode ON & set high bits of characters
X'11'	stop setting high bits (leaving reversed fields on screen)
X'15'	swap space compression & special chars
X'18'	move cursor left
X'19'	move cursor right
X'1A'	move cursor down
X'1B'	move cursor up
X'1C'	cursor to top left, set 80 char/line, turn reverse mode off
X'1D'	cursor to left margin
X'1E'	erase to end of line
X'1F'	erase to end of frame

HOST6A performs the following translations for characters displayed via the system @PUT or @DSP SVCs:

X'08' = X'08', X'20', X'08'	Backspace and delete
X'0A' = X'0D', X'0A'	Carriage return, line feed
X'0D' = X'0D', X'0A'	Carriage return, line feed
X'0E' or X'0F' = ESC .	Cursor on/off (ignored if already set correctly)
X'10' = ESC G 4	Reverse video ON
X'11' = ESC G 0	Reverse video OFF
X'18' = X'08'	Backspace (unless at top left of screen)
X'19' = X'06'	Cursor right (unless at bottom right)
X'1A' = X'0A'	Cursor down
X'1B' = X'1A'	Cursor up (unless on top line)
X'1C' = ESC Y 0 0	Cursor home (top left) also sends ESC G 0 if host in reverse video mode
X'1D' = X'0D'	Cursor to beginning of line
X'1E' = ESC K	Clear to end of line
X'1F' = ESC k	Clear to end of frame

All characters with values higher than X'7F' are transmitted as X'7FH'.

HOST6A handles the system @VDCTL SVC functions in the following manner:

VDCTL function #	action taken
1	get char from HOST screen only
2	put char in C at row, column in HL position remote cursor send character (values below X'20' are changed to "^") reposition cursor to previous location (auto-scroll is temporarily disabled if the location is the last position on the screen)
3	set cursor position to row, column in HL send ESC Y r c r is row + X'20' c is column + X'20'
4	return cursor position from HOST only
5	move 80 x 24 block to screen turn off auto-scroll position cursor to 0,0 send characters, translating values below X'20' to "^", and values above X'7F' to X'7F' restore auto-scroll
6	get 2K video from HOST screen only
7	scroll protect 0 to 7 lines not functional on ADDS terminal
8	set cursor character to value in C not functional on ADDS terminal

HOST6A translates received characters corresponding to the arrow key values of the ADDS25.

Character received	character returned as input
X'06' <right-arrow>	X'09' <right-arrow> (tab)
X'0C' <shift><clear>	X'1F' (clear screen)
X'1A' <up-arrow>	X'1B' <up-arrow> (escape)

HOST6V performs the following translations for characters displayed via the system @PUT or @DSP SVCs:

X'1B' = X'1B', X'1B'	cursor up
X'11' = X'1B', X'41'	end reverse video

HOST6V handles the system @VDCTL SVC functions in the following manner:

VDCTL fcn #	action taken
1	get char from HOST screen only
2	put char in C at row, column in HL send ESC X r c char r is row + X'20' c is column + X'20'

```

3      set cursor position to row, column in HL
      send ESC Y r c
      r is row + X'20'
      c is column + X'20'

4      return cursor position from HOST only

5      move 80 x 24 block to screen
      send ESC V
      send 80 x 24 screen image

6      get 2K video from HOST screen only

7      scroll protect Ø to 7 lines
      send ESC S n
      n = Ø to 7 + X'20'

8      set cursor character to value in C
      send ESC C n
      n = new cursor char

```

The HOST61, HOST6A, and HOST6V programs install program code into high memory when loaded, using the standard header format for high memory modules. A program could be written to find the header using the @GTMOD SVC, and examine or modify certain parts of the data area of the running HOST program if necessary for a particular application. An outline of the header and data area follows.

```

START:   JR      NEWKI    ;branch around header
OLDHI:   DW      $$       ;last byte used by module
NAME:    DB      6,'HOST6A' ; or 'HOST61' or 'HOST6V'
DCB:     DW      Ø        ;required by the system
SPARE:   DW      Ø        ;required by the system
;
DATA     EQU      $        ;The data area begins here...
STATUS   EQU      $-DATA   DB      ØØ111ØØ1B ;default setting depends on host version
;BIT Ø    1=no user, Ø=user is logged in
;BIT 1    1=XOFF has been received
;BIT 2    1=Host program has transmitted XOFF
;BIT 3    1=dump XON/XOFF characters received (but observe request)
;         Ø=return XON/XOFF as KB input (and observe request)
;BIT 4    1=Send CR as CR/LF sequence
;         Ø=send CR only
;BIT 5    1=Xlate LF to CR (then observe BIT 4)
;         Ø=do not xlate LF
;BIT 6    1=log new user
;         Ø=just start host function with carrier detect
;BIT 7    1=Send entire screen at logon (not used by HOST61)
;         Ø=do not send host screen
;

```

```

DSTAT      EQU      $-DATA      ;device I/O status
DB         11100101B   ;depends on setup

;BIT 0      1=accept RS232 input as keyboard input
;           0=do not accept RS232 input
;BIT 1      0=send video output to RS232
;           1=do not send output to RS232
;BIT 2      1=accept input from host keyboard
;           0=lock out host keyboard
;BIT 3      0=send chars to host video
;           1=lock out host video
;BIT 4 (used by HOSTA only)
;           1=host machine has reversed video
;           0=host has not reversed video
;BIT 5 (used by HOSTA only)
;           0=host has special char instead of space compression
;           1=expand space compression codes
;BIT 6 (used by HOSTA only)
;           0=user has turned cursor off
;           1=cursor should be on
;BIT 7      0 = accept only 0-X'7F' (strip high bit)
;           1 = accept 0-X'FF' (do not strip high bit)

;stop/start chars RECEIVED from remote
XFFCHR     EQU      $-DATA
XFR:       DB       'S'-40H   ;pause character (unless X'00')
XNCHR     EQU      $-DATA
XNR:       DB       'Q'-40H   ;restart character (unless X'00')
;
;stop/start chars to SEND for input buffering
XFFCHS    EQU      $-DATA
XFS:       DB       'S'-40H ;pause character to send (unless 0)
XNCHS     EQU      $-DATA
XNS:       DB       'Q'-40H ;restart character to send (unless 0)
;
;single character translate for RECEIVED characters
XRLF      EQU      $-DATA
           DB       0        ;translate FROM this character
XLRT      EQU      $-DATA
           DB       0        ;TO this one
;
;single character translate for TRANSMITTED characters
XLSF      EQU      $-DATA
           DB       0        ;translate FROM this character
XLST      EQU      $-DATA
           DB       0        ;TO this one
;
;Break character received clears input buffer
;Note: this is tested AFTER translation by COM/DVR
BREAK     EQU      $-DATA
BRK:       DB       80H      ;character to clear buffer
;
NULLS     EQU      $-DATA
NLS:       DB       0        ;Number of NULLs transmitted after CR
;
EXTRA     EQU      $-DATA
DB         0        ;not used
;

```

```
PASSW      EQU      $-DATA
PSWD:      DB      0      ;password length (0=no password)
MPW$:      DB      0,0,0,0,0,0 ;password storage
          DB      0,0,0,0      ;ten char max
```

XMODEM file transfer program

XMODEM/CMD performs file transfers with another computer running XMODEM or a program with a compatible protocol, such as one of the CP/M MODEM programs. It may be used alone or in combination with the host or terminal programs, and will transfer an exact copy of any type file with only one exception. For compatibility with the CP/M and other versions of the protocol, data must be transmitted in blocks of 128 characters. Since TRSDOS/LDOS files do not necessarily end at a multiple of 128 characters, the last record of the file may be padded with NULL (X'00') characters. This will not affect loading or operation of program files (object code or BASIC), and will not normally affect data files. If the exact end-of-file information must be maintained for some application, the HEX/CMD utility may be used to create an ASCII hex image of the file before transmission. The conversion back to binary will then establish the correct file length in the disk directory.

The operating system COM/DVR must be loaded and the SETCOM command used to establish the correct baud rate (if it is not the default setting) before running XMODEM. The device name used in the SET command when loading COM/DVR does not matter, and any FILTERing of the RS232 device will be ignored. XMODEM will temporarily reset the RS232 parameters to 8-bit words, no parity (as needed by the protocol) during the file transfer, then restore the previous settings when finished.

The command to send a file is: XMODEM S filespec

to receive a file: XMODEM R filespec

If only S or R is specified on the command line, a prompt will be given for the filename. The filespec specified for sending must exist, or the error message "File not in directory" will be displayed and the program will terminate. The filespec specified for receiving must NOT exist, or the error message ">> File already exists" will be displayed and the program will terminate. To receive a file with the same name as an existing file, it is necessary to first rename or remove the existing file.

After the file is opened, the sending computer will display "Ready to send - awaiting initial NAK" (The initial NAK is a signal from the receiving computer that it is ready), until the receiving program starts the transfer or the wait period "times out" (in about 1 1/2 minutes).

The receiving computer will display "Ready to receive - awaiting transmission" and the starting block number while attempting to signal the sending computer to begin. If the sending and receiving programs are executed within the timeout limit of 1 1/2 minutes of each other, the transfer will begin automatically, otherwise timeout will occur. The error message ">> File transfer aborted!" will be displayed.

During the file transfer, a block number is displayed as each 128 byte block of data is transmitted. Each block is verified using a checksumming technique and blocks containing errors are automatically retransmitted. An asterisk is displayed by the block number if it is necessary to retransmit, and more than 10 retries on a single block will cause the program to terminate. When the entire file has been transmitted, the files are closed and the program terminates. The transfer can be interrupted at any time by typing <CTRL><X> at the keyboard, although it may take several seconds before the program recognizes the interruption and actually terminates.

Examples of file transfer commands:

Using XMODEM/CMD alone with operators at both ends:

First, be sure that COM/DVR is installed in the operating system and set for the correct baud rate, then establish the RS232 connection.

With both computers at DOS command level, the operator wishing to send the file types:

XMODEM S filespec

while the operator planning to receive the file enters:

XMODEM R filespec

The file transmission will proceed. At completion, the computers will be returned to the DOS command level.

Using XMODEM/CMD with host and terminal programs for file transfers with one computer unattended:

The XMODEM/CMD program must be available on both the host and terminal computer's disks, and the file transfer commands for both computers must be issued by the operator running the terminal program. Establish communications between the two computers using the terminal program. To have the host computer send a file to the computer acting as the terminal, first start the program at the host end. At DOS command level on the host machine, type the command "XMODEM S filespec", then wait for the "Ready to send" message to appear before leaving the terminal program (some error message may appear at this point if the host computer cannot access either the XMODEM/CMD program or the file specified).

When the XMODEM program is ready at the host end, begin the procedure to receive at the terminal end. The COMM/CMD, ADDS25/CMD and TERM6/CMD programs allow execution of a DOS command (or any program which does not use memory above X'3000'), by pressing <CLEAR><SHIFT><0> or <CLEAR><SPACE>. When running a terminal program that does not allow a DOS command within the program, it will be necessary to exit to DOS at this point. Using either method, issue the command XMODEM R filespec. When the file transfer is complete, the host computer will return to DOS command level. If XMODEM was invoked from within the terminal program, control will return to the terminal program, otherwise, it will be necessary to re-load the terminal program to continue communication with the host computer.

The procedure to transmit a file to the host computer is identical, but the S and R commands are reversed. The host is given the command XMODEM R filespec, then the local machine is given the command XMODEM S filespec.

XMODEM/CMD may be invoked from a BASIC program (which may be running under a host program's control using the syntax (within the BASIC program): SYSTEM "RUN XMODEM S (or R) filespec". The RUN command is necessary because BASIC will normally only allow DOS commands to be executed using the SYSTEM command. An error will be returned to BASIC if the file transfer request fails.

Likewise, a running machine language program can invoke XMODEM/CMD by using the @CMNDR SVC to pass the command to the operating system. The program should first protect itself by setting LOW\$ (using the @HIGH SVC). XMODEM requires memory up to X'3000, but will execute the transfer faster if more memory is available to buffer the file sectors. In addition to the possible DOS errors that might be encountered in handling the file, XMODEM may return the following error codes in HL when called via @CMNDR:

X'FF = parameter error (S or R not specified)

X'FE = not enough memory (LOW\$ set below X'3000)

X'FD = attempted to Receive an file which already exists
X'FC = timeout, too many transmission errors, or remote abort
X'FB = device driver error (COM/DVR not installed)
X'FA = manual abort (CTL-X was pressed)

If the file transfer is successful, HL will contain a zero when control is returned to the calling program.

HEX file conversion utility

The HEX/CMD utility has five functions:

- 1 Convert a binary file to ASCII hex image
- 2 Convert ASCII hex image to binary
- 3 Checksum a file
- 4 Convert a load module file to INTEL hex format
- 5 Convert INTEL hex format to load module

Functions 1, 2, 4, and 5 will prompt for input and output files. Function 3 requires only an input filespec, and will display the calculated 2 digit hex number.

The XMODEM/CMD file transfer program will transfer any type of file with no conversions, and is the recommended method when a compatible program is available for the remote computer.

Data and programs are stored in the TRS-80 as 8-bit binary values. Machine language programs, binary data files and basic programs saved without the ",A" option will contain all possible combinations of 8-bit values. Many computers and terminal programs use the high order bit of the character as a parity bit for error checking, ignore nulls (PF characters) and use certain characters to control transmission functions.

Transferring data with these computers requires the character set to be limited to certain combinations of 7-bit values, generally called "ASCII characters". Files saved with BASIC's SAVE "PROGRAM",A , or SCRIPSIT'S S,A FILENAME will meet these requirements. Machine language programs and binary data files require conversion into the ASCII character set before transmission unless done with the XMODEM/CMD program. The HEX/CMD program will perform this conversion by changing each binary character in the file into two ASCII characters representing the hex value of each actual byte. Carriage returns are placed in the file every 60 characters. This file may then be transmitted in the terminal mode. For example, a machine language program could be converted to hex, uploaded to a MicroNET file, downloaded by another TRS80 and re-converted to binary.

The checksum function allows a quick method of checking that the file has been transferred successfully. If the checksum of the received file is the same as the file that was transmitted, it is very likely that no errors occurred during the transfer.

INTEL hex is a standard format used to exchange machine code. This format should only be used when required by another machine, typically to transport machine language programs assembled on one computer, but intended to run on another. The INTEL hex format does not provide a transfer address as required for TRSDOS/LDOS load module files, so the program will display both the lowest load address and the transfer address when converting from load module to INTEL hex. When converting to load module format, the program will display the lowest load address in the file and prompt for the transfer address. Pressing <ENTER> will cause the lowest load address to be used as the transfer address. The INTEL hex format files contain a checksum value for each record. If any checksum is found to be incorrect during the conversion to a load module file, an error message will be displayed and the program will terminate.

General information - RS232 description

The Recommended Standard 232-C (the C means the third revision) describes the cable standards for connecting Data Terminal Equipment (the TRS-80) to Data Communications Equipment (a modem). It does not specifically cover connecting two pieces of Data Terminal equipment together (TRS-80 to TRS-80 or TRS-80 to a terminal or printer. This connection can be accomplished, however, by switching the appropriate lines in the connecting cable.

The Electrical Signal Characteristics:

Signal Voltage	Condition
+24v to + 3v	"spacing" state
+ 3v to - 3v	undefined state
- 3v to -24v	"marking" state

The Radio Shack RS232 interface provides the following signals:

Pin #	Abbrev.	EIA designation	Description
1	PGND	AA	Frame ground
2	TD	BA	Transmit Data
3	RD	BB	Receive Data
4	RTS	CA	Request-to-Send
5	CTS	CB	Clear-to-Send
6	DSR	CC	Data Set Ready
7	SGND	AB	Signal Ground
8	CD	CF	Carrier Detect
20	DTR	CD	Data Terminal Ready
22	RI	CE	Ring Indicator

Signal descriptions

Group A - Grounds

Protective Ground: Pin 1 should be connected to the equipment frame. If the connected equipment may be plugged into different circuits where the ground potential might be at a different level, this wire should be connected at one end only.

Signal Ground: Pin 7 - Reference ground for all the other signals and must be connected at both ends of the cable.

Group B - Data Signals

For the data circuits, the following conditions apply:
Signal condition: Binary state

Marking	1
Spacing	0

Transmit Data - Pin 2: Direction: computer to modem

Signals on this circuit are generated by the data terminal (TRS-80) for transmission to the remote equipment.

Receive Data - Pin 3: Direction: modem to computer

Signals on this line are received from the remote equipment.

Group C - the control signals

For the control signals, the following conditions apply:

Signal condition:Function

Mark OFF, false

Space ON, true

Note that this is the reverse of the conditions for the data signals. In the TRS-80, the ON condition of a line from the modem is sensed by reading a 0 in the corresponding bit of the port, a control line from the TRS-80 is set ON by writing a 0 to the bit position indicated in the manual.

Request to Send - Pin 4: Direction: computer to modem

This signal indicates that the computer wishes to send some data. With half duplex equipment, it will initiate the switch to the transmit mode.

Clear to Send - Pin 5 Direction: modem to computer

Indicates that the modem is ready to transmit data.

RTS and CTS are primarily used to control the direction of data transfer with half duplex equipment. Full duplex modems normally tie RTS to the CTS line since they are always ready to transmit.

Data Set Ready - Pin 6 Direction: modem to computer

This signal indicates that the modem is powered on and functional. For an auto-answer modem, it indicates that the phone line is off-hook.

Data Terminal Ready - Pin 20 Direction: computer to modem

This signal indicates that the data terminal (TRS-80) is powered on and ready to communicate. A modem equipped for auto answer will go off-hook phone only when DTR is on.

Ring indicator - Pin 22 Direction: modem to computer

"ON" indicates the phone is ringing and it will be off between ringing cycles.

Carrier Detect - Pin 8 Direction: modem to computer

When "ON", this signal indicates that the modem is receiving a carrier tone from the remote equipment.

GLOSSARY OF DATA COMMUNICATIONS TERMS

ACK The ASCII value X'06' which is sometimes used in communications as a control character meaning "acknowledged".

ASCII American Standard Code for Information Interchange. This is the code established as an American Standard by the American Standards Association, and defines the character set used by most manufacturers other than IBM.

Asynchronous Serial Transmission A method of data transfer that uses framing bits to surround each character. The transmitter and receiver are synchronized for only one character at a time. The time between characters is not critical.

Baud A unit of transmission speed. One baud corresponds to a rate of one signal element per second. 300 baud is thus 300 signal elements or bits per second. If transmitting one character requires a total of 10 bits, a rate of 300 baud will correspond to a rate of 30 characters per second.

Bit A single unit of information. The name is a contraction of "binary digit", and it is the smallest unit of information in a binary system. It is the choice between two possible states, usually designated one and zero.

Bit Rate The speed at which bits are transmitted, expressed as bits per second.

Buffer Data storage used to compensate for a difference in transmission rates or timing of events when transferring data from one device to another.

Carriage Return In a character-by-character printing mechanism, the operation that causes the next character to be printed at the left margin. In the TRS-80 and some printers, a carriage return character (X'0D') will cause the next character to be printed at the left margin of the next line.

Character The actual or coded representation of a digit, letter, or symbol.

Code A system of symbols and rules for representing information.

Code Conversion The conversion of data from one code to another.

Data Any representations such as characters, binary signals or analog quantities to which meaning might be assigned.

Data Communication The movement of encoded information through electrical transmission systems.

Data Set A device that converts the signals of a computer or terminal to signals that are suitable for transmission over communication lines and the reverse. Also called a modem.

Demodulation The process of separating an original signal from a modulated carrier frequency.

Duplex A communication channel allowing simultaneous and independent transmission in both directions. Often referred to as Full Duplex.

Half-Duplex An alternate one-way-at-a-time transmission method.

Hard Copy Printed output.

Modem Contraction for modulator-demodulator. A device that modulates signals into a form suitable for transmission over communication facilities, and retrieves the signals by demodulation.

Modulation A process of altering some characteristic of a carrier signal in accordance with the content of a lower frequency information signal.

NAK The ASCII value X'15' which is sometimes used as a control character to signal "negative acknowledge".

NULL May refer to the ASCII value X'00' or to a character which is transmitted only to cause a delay before the next valid character. Hard copy terminals may require a delay after a carriage return to allow time for mechanical action to occur. This delay is frequently accomplished by transmitting a number of NULL characters after each carriage return or carriage return, line feed sequence. Some computers use the X'7F' character for the delay at the end of each line, and both the X'00' and X'7F' characters are frequently ignored in data transmissions.

Parallel Transmission A method of data transfer where all the bits of a character are transmitted simultaneously.

Parity Using the most-significant bit of a character to determine the accuracy of transmission. For even parity, this bit is set to make the total of the one bits of a character add up to an even number. By convention, asynchronous communication uses even parity, synchronous uses odd parity, but this is not always observed. Over phone lines, parity bits are not a dependable method to verify accuracy, since a noise burst is typically longer than one bit interval.

RS232C A standard cable and signal definition to connect data terminal equipment to data set equipment, typically terminal to modem.

Serial Transmission A method of data transfer in which the bits of a character are sent sequentially.

Simplex Channel A communication channel that permits transmission in one direction only.

Start Bit A framing bit used in asynchronous transmission to indicate the beginning of a character.

Stop Bit A framing bit used in asynchronous transmission to indicate the end of a character transmission and allow the receiver to find the next start bit. Mechanical equipment may require two stop bits to allow time to handle the character; electronic equipment usually require only one stop bit.

Synchronous Serial Transmission A method of transmission that sends a serial bit-stream with no start or stop bits. A block of data is transmitted along with a clock signal to synchronize the transmitter and receiver. This method requires more expensive equipment than asynchronous transmission and is generally not used with microcomputers.

Terminal An input/output device that can send or receive data.

Word Length The number of bits used to transmit one character. A parity bit may be added to this length if parity is being used, but framing bits (stop and start bits) are not counted.

XOFF A control character (typically a control-S or X'13') used to request a pause in transmission.

XON A control character (typically a control-Q or X'13') used to resume transmission after a pause.

IMPORTANT NOTICE

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